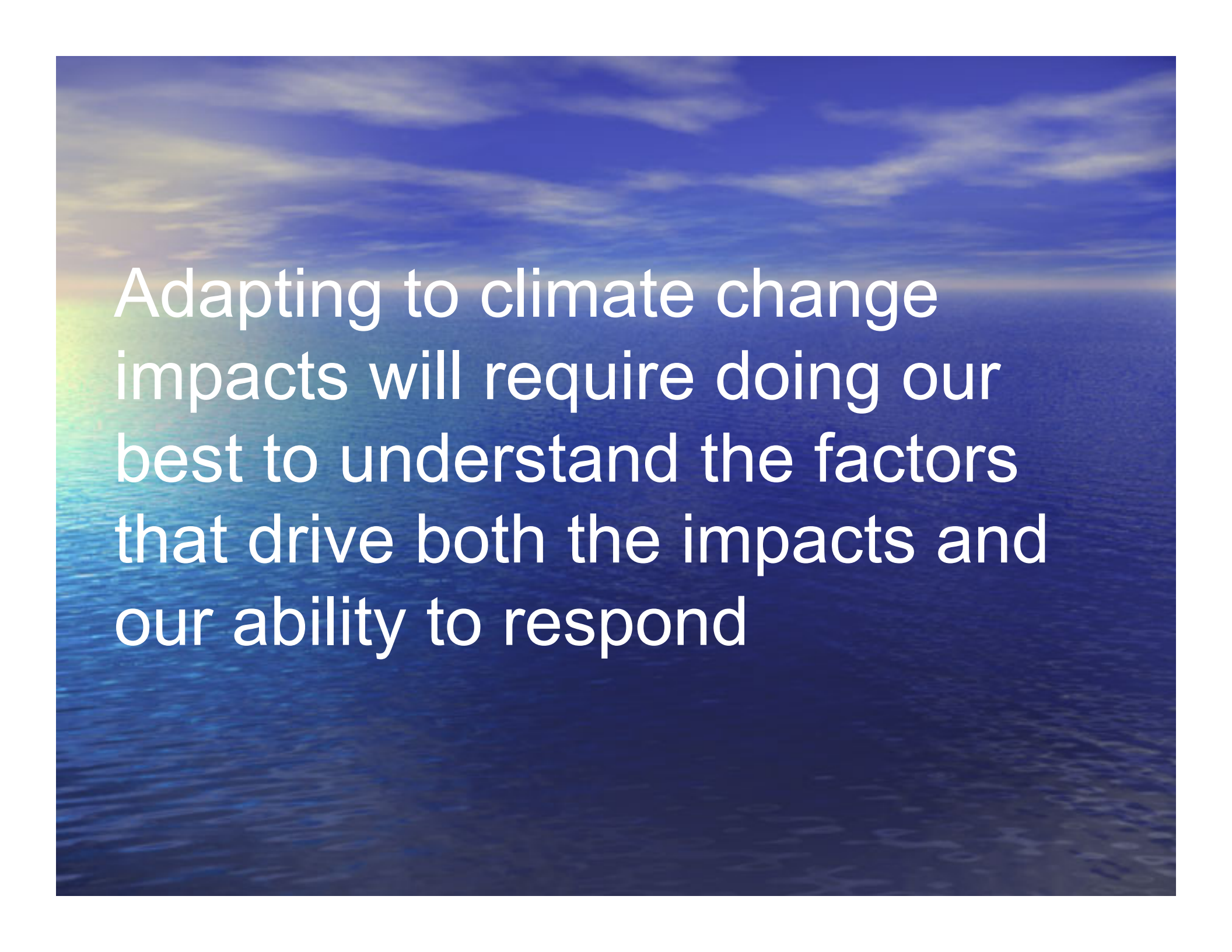


# Using Vulnerability Assessment Results to Inform Agency Decisions



**John O'Leary and Hector Galbraith**  
**Massachusetts Division of Fisheries and Wildlife and**  
**Manomet Center for Conservation Sciences**  
**Coastal Habitat Conservation in a Changing Climate:**  
**Strategies and Tools in the Mid-Atlantic, Wilmington,**  
**Delaware, June 21-23, 2010**



Adapting to climate change impacts will require doing our best to understand the factors that drive both the impacts and our ability to respond



**Adapting to the Impacts of  
Climate Change  
America's Climate Choices:  
Panel on Adapting to the Impacts  
of Climate Change**

Board on Atmospheric Sciences and  
Climate

Division on Earth and Life Studies

# Project Goal

To ensure that the wildlife conservation strategies detailed in the State Wildlife Action Plan (SWAP) are adapted for climate change impacts

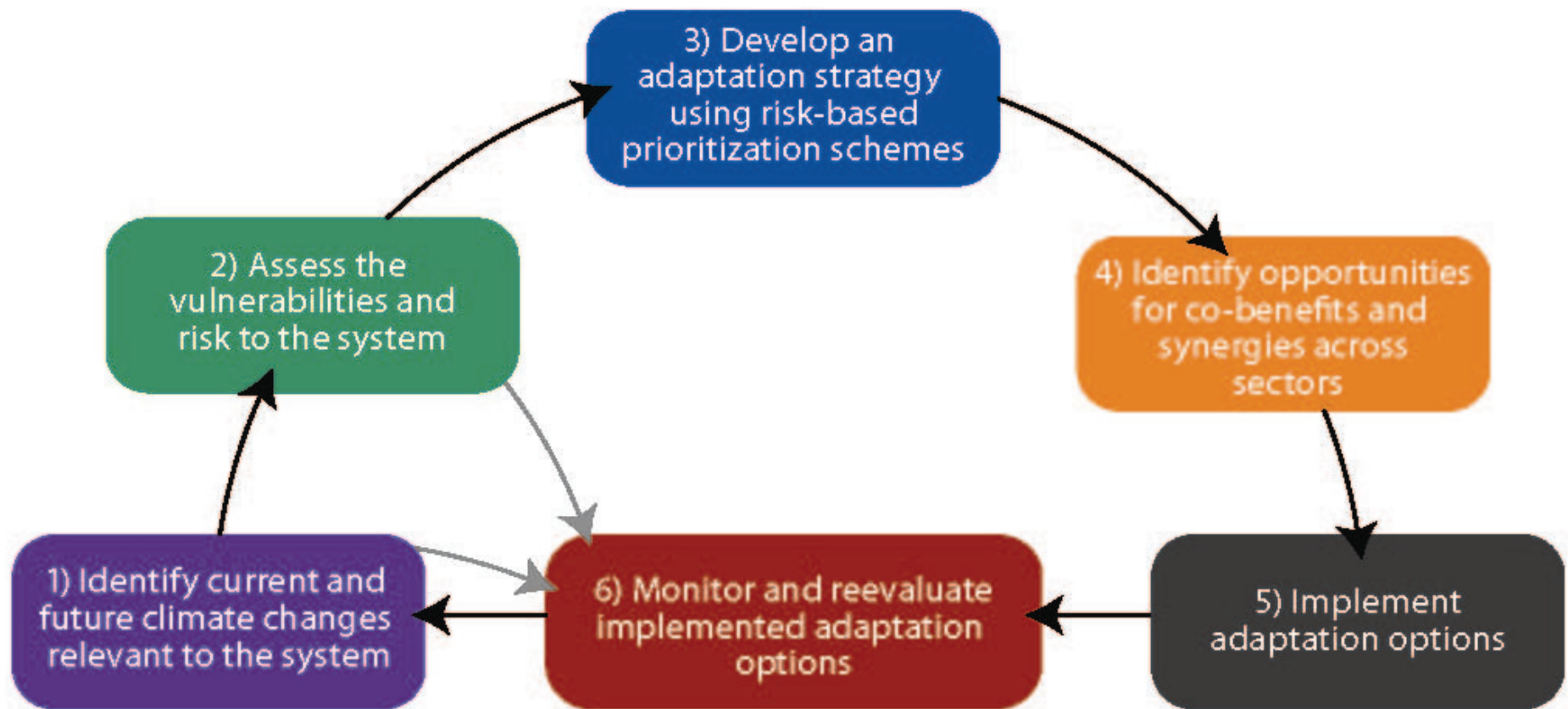
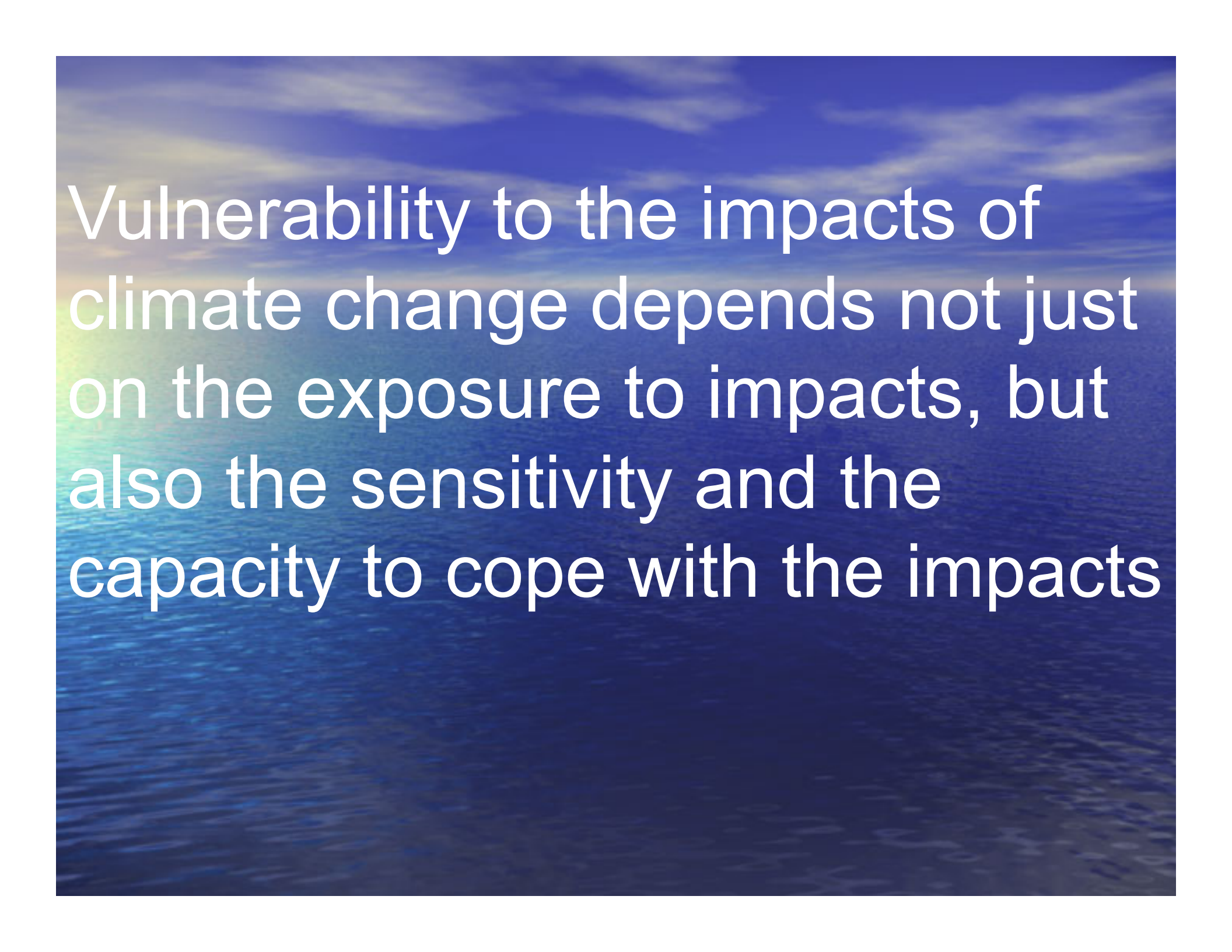


FIGURE S.1 The planning process is envisioned to incorporate the following steps: 1) Identify current and future climate changes relevant to the system; 2) Assess the vulnerabilities and risk to the system; 3) Develop an adaptation strategy using risk-based prioritization schemes; 4) Identify opportunities for co-benefits and synergies across sectors 5) Implement adaptation options 6) Monitor and reevaluate implemented adaptation options.

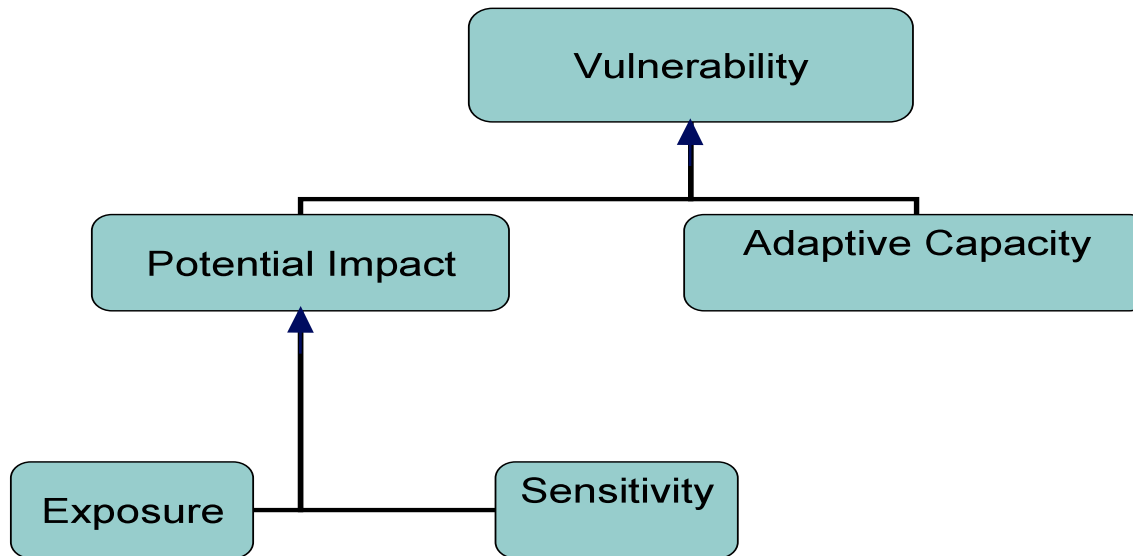
The background of the slide is a photograph of a sunset or sunrise over a body of water. The sky is a deep blue with wispy white clouds. A bright, multi-colored rainbow is visible on the left side of the image, arching over the horizon. The water in the foreground is dark blue with small, shimmering ripples.

Vulnerability to the impacts of climate change depends not just on the exposure to impacts, but also the sensitivity and the capacity to cope with the impacts

# Vulnerability Assessments

## Vulnerability and Its Components

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# Climate Change Information used in Vulnerability Assessment

- Results from Northeast Climate Impacts Assessment Report (*Hayhoe 2006*)
- High and low carbon dioxide emissions scenarios
- Provided information on future climate conditions: temperature; type , amount and timing of precipitation; extreme events

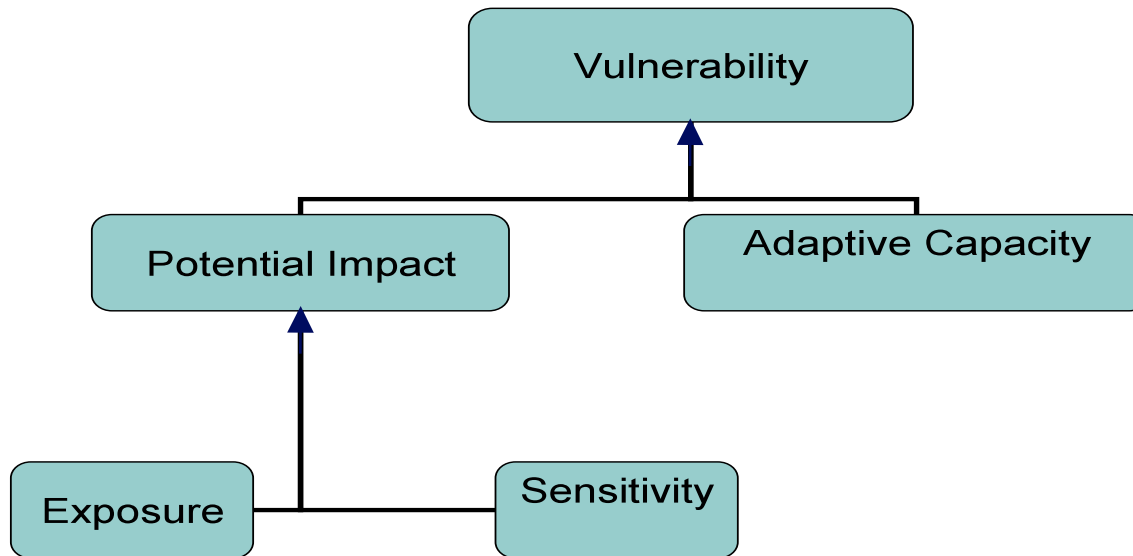
# **Sensitivity and Adaptive Capacity Variables**

- 1. Current rate of loss**
- 2. Elevation**
- 3. Latitude**
- 4. Vulnerability to increasing temperature**
- 5. Vulnerability to increased attack by biological stressors  
(grazers and browsers, pests, invasives, pathogens)**
- 6. Habitat intrinsic dispersive rate**
- 7. Vulnerability to increased frequency or intensity of extreme  
events (fire, drought, windstorms, floods)**
- 8. Vulnerability to phenologic change**
- 9. Vulnerability to human maladaptive responses**
- 10. Vulnerability due to obstacles to range shifts**
- 11. Likely future impacts of non-climate stressors**

# Vulnerability Assessments

## Vulnerability and Its Components

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# Expert Panel Approach

- Develop draft assessment narrative for each habitat type
- Meet with experts to review draft
- Edit, amend, add, delete, new thoughts
- Back to experts
- Complete narrative, assign ranking, apply confidence value

# HABITAT VULNERABILITY CATEGORIES

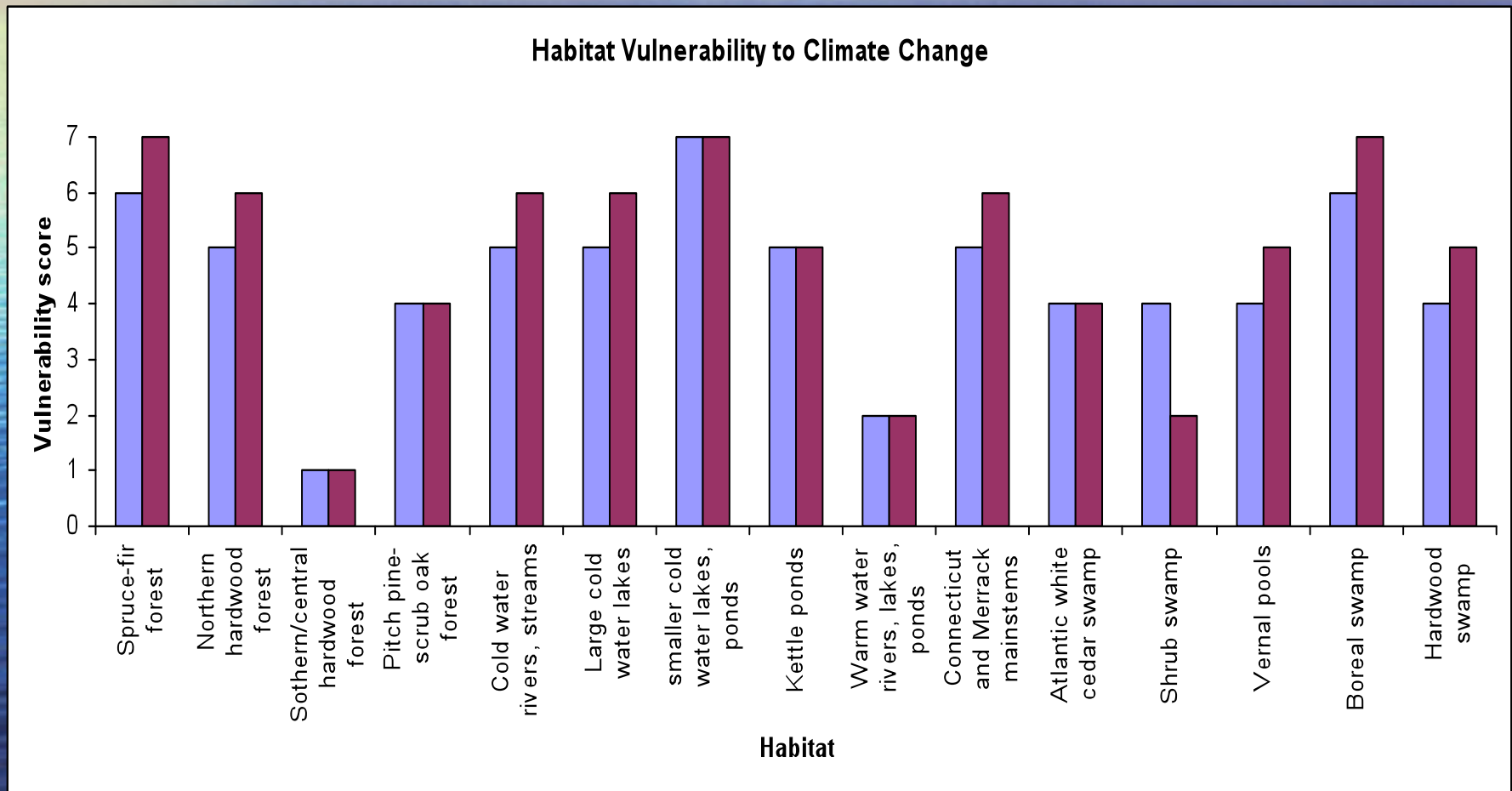
- 7 High risk of being eliminated entirely from state
- 6 Majority of habitat may be eliminated ( $>50\%$ ) but not entirely
- 5 Risk of substantial reduction in habitat area ( $<50\%$  loss)
- 4 Extent of habitat may not change appreciably
- 3 Habitat may become established in state
- 2 Extent of habitat may expand moderately ( $<50\%$ )
- 1 May greatly benefit from climate change ( $>50\%$  range extension)

# CONFIDENCE EVALUATION

- High confidence >70% confidence
- Medium confidence between 30% and 70% confidence
- Low confidence <30% confidence
- This system is based on the 5-category scale developed by Moss and Schneider for the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report.

# Results:

## Preliminary Vulnerability Rankings



## PITCH PINE-SCRUB OAK VULNERABILITY EVALUATION

NTWHCS category: *Northeastern Interior Pine Barrens/North Atlantic Coastal Plain Pitch Pine barrens*

State ranking S2

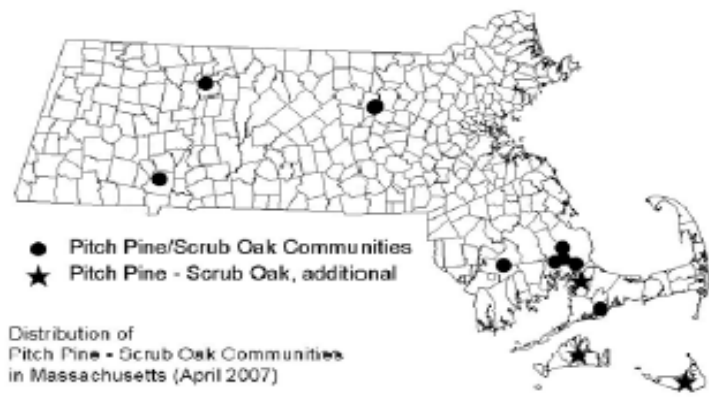
Vulnerability score

4 (both emissions scenarios)

Confidence evaluation Low<sup>[sb.1]</sup>

### Rationale

Its range extending south to New Jersey and Maryland, this community type reaches its northern limit on sandy, nutrient-poor, drought-prone soils in southern Maine, on Cape Cod, in the southern part of the Massachusetts coastal plain, and in the Connecticut River Valley (see Massachusetts Natural Heritage and Endangered Species Program map below). It is therefore a southern community type that extends into southern and central New England. Its canopy is dominated by Pitch Pine, with an understory of Scrub Oak, Huckleberry, and Lowbush Blueberry. The system is fire-maintained and will revert to White Pine or oak-dominated forest in the absence of fire (NHESP, 2007).



### Figure 1. Distribution of Pitch pine-scrub oak communities in Massachusetts.

Pitch pine-scrub oak occurs in significantly warmer climates to the south in New Jersey and Maryland. If the only determinant of its distribution were climate, it would be likely that its distribution in Massachusetts would extend under a warming climate. However, non-climatic factors, mainly the distribution of sandy, nutrient-poor soils; fire frequency; and development, are also important factors. These are likely to be the main limiting factors in any future spread of pitch pine barrens, not climate change. Based on this, a vulnerability score of 4 (extent of habitat may not change appreciably under climate change) has been assigned for both scenarios. The confidence score that we assign for this community type is Low. This is because its future distribution is dependent on uncertain human settlement patterns and responses to climate change. Urban development is already a major fragmenting factor affecting this forest type and it is unlikely that this pressure will ease over the next few decades. Also, as the summers warm and droughts become more frequent and prolonged, fire outbreaks may become more frequent and/or intense. How humans respond to this is a major uncertainty. If the societal response is increased fire suppression (to protect property and lives), it could result in further loss and fragmentation of this habitat type.

# Products

- **CLIMATE CHANGE AND MASSACHUSETTS FISH AND WILDLIFE: INTRODUCTION AND BACKGROUND**
- **CLIMATE CHANGE AND MASSACHUSETTS FISH AND WILDLIFE: HABITAT AND SPECIES VULNERABILITY**
- **CLIMATE CHANGE AND MASSACHUSETTS FISH AND WILDLIFE: HABITAT MANAGEMENT**

# Using the Vulnerability Assessment Results

- **Management:** Develop site Management Plans for a limited number of Wildlife Management Areas
- **Acquisition:** Add results of the Vulnerability Assessment under threats in existing land acquisition process
- **Regulation:** Climate change impacts may require changes to existing regulations. Examples include: intermittent versus perennial stream designation, allowed wetlands protection measures
- **Monitoring:** Working with USGS to develop a plan that will include wetlands and other aquatic habitat types

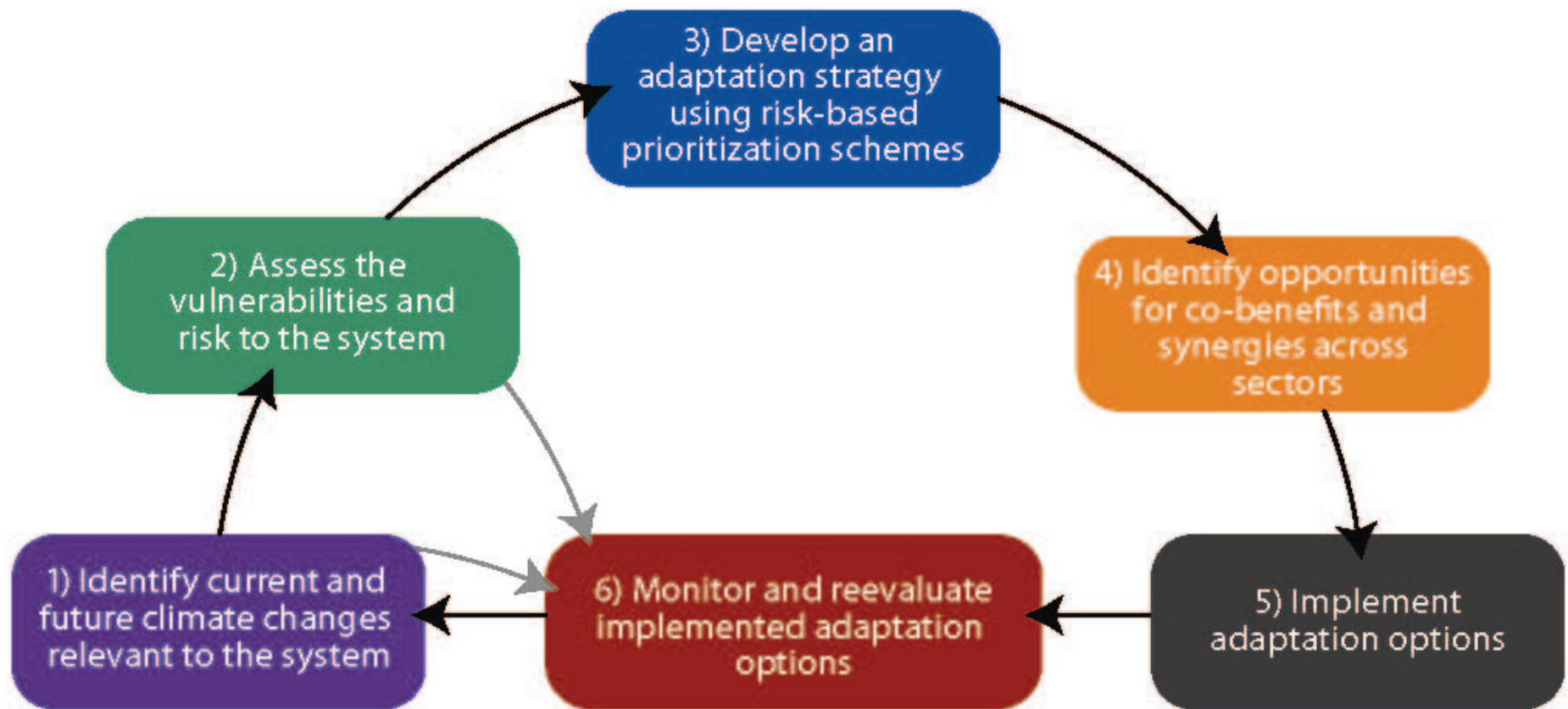
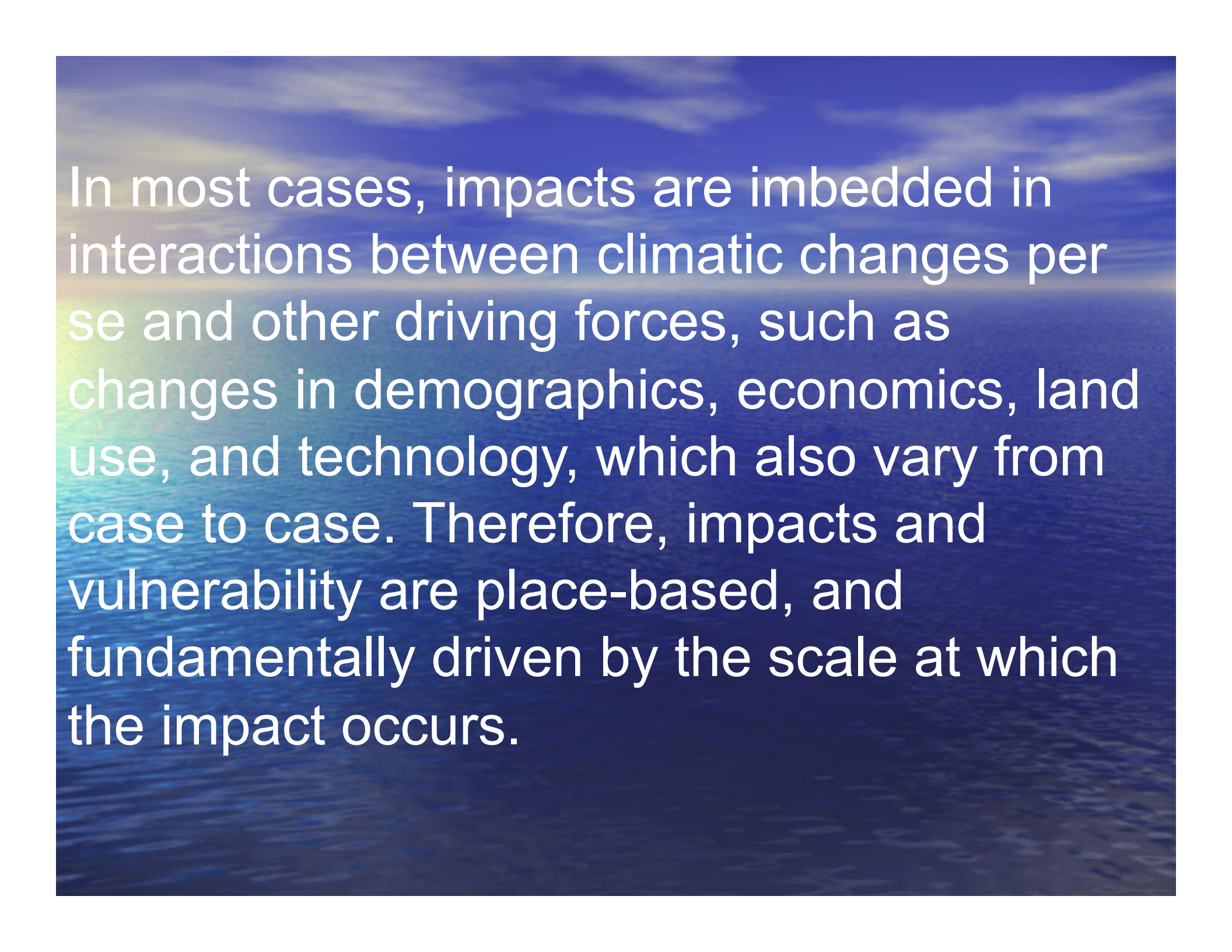
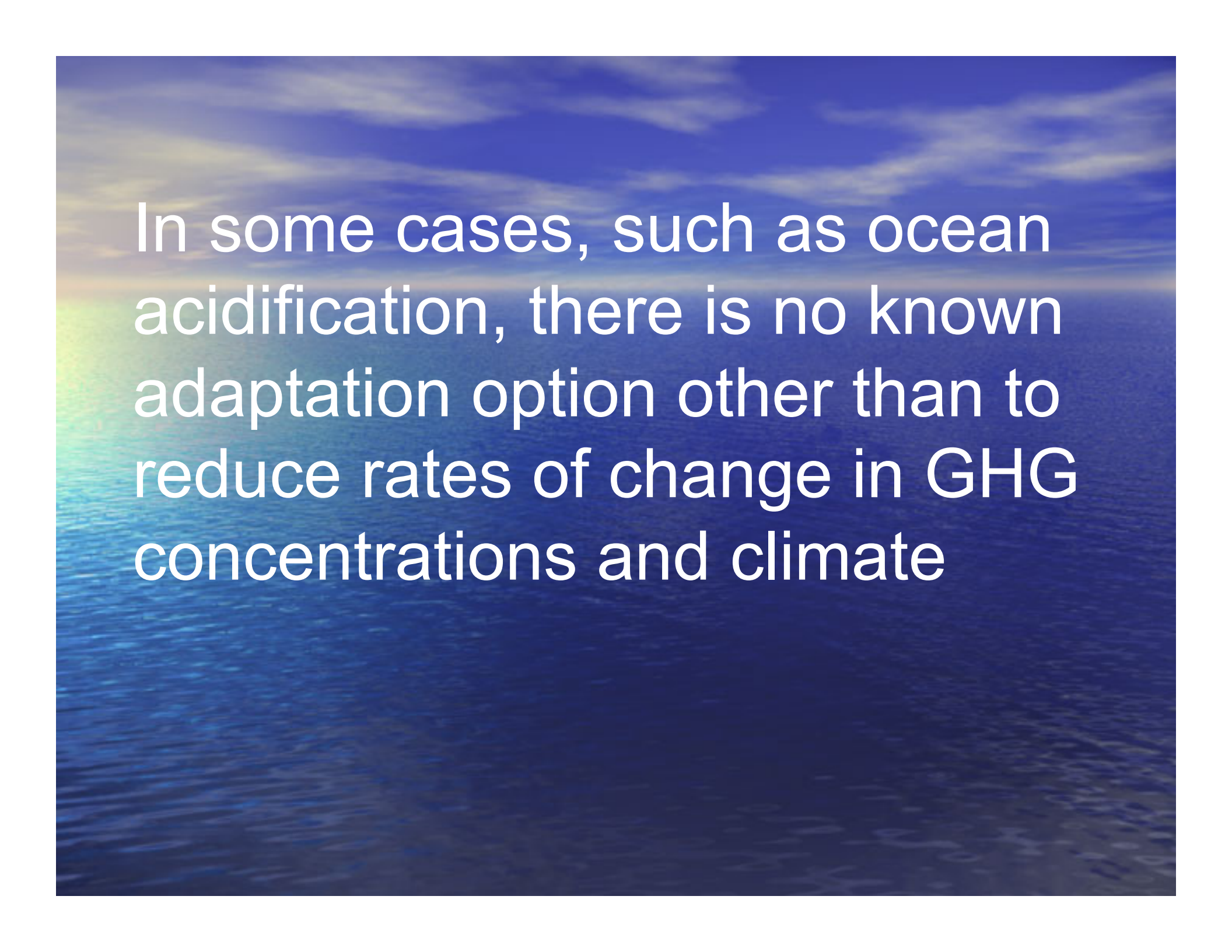


FIGURE S.1 The planning process is envisioned to incorporate the following steps: 1) Identify current and future climate changes relevant to the system; 2) Assess the vulnerabilities and risk to the system; 3) Develop an adaptation strategy using risk-based prioritization schemes; 4) Identify opportunities for co-benefits and synergies across sectors 5) Implement adaptation options 6) Monitor and reevaluate implemented adaptation options.



In most cases, impacts are imbedded in interactions between climatic changes per se and other driving forces, such as changes in demographics, economics, land use, and technology, which also vary from case to case. Therefore, impacts and vulnerability are place-based, and fundamentally driven by the scale at which the impact occurs.



In some cases, such as ocean acidification, there is no known adaptation option other than to reduce rates of change in GHG concentrations and climate

# **In Summary**

searches for adaptation solutions should consider consequences both for multiple sectors and for the short and the long term. In addition, a comprehensive understanding of the psychological, social, and political obstacles to adaptation is required, as well as an understanding of how to overcome them. Failure to do so frequently increases both vulnerability to climate change and the costs of adaptation over the longer term; it may also reduce incentives to explore more effective long-term solutions.

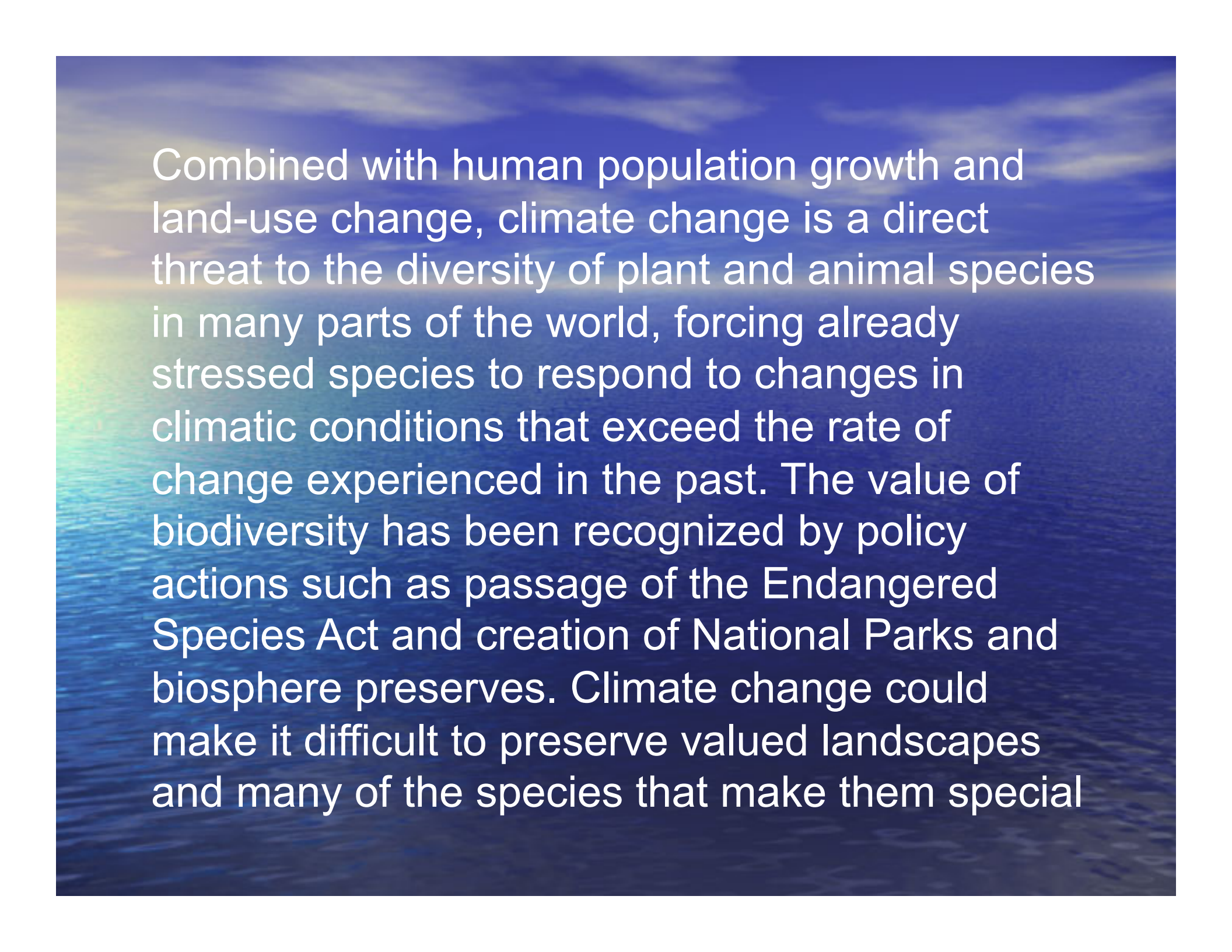
# Regional Context

- Northeast Association of Fish and Wildlife Agencies Regional Conservation Needs
- U.S. Fish and Wildlife Service Landscape Conservation Cooperatives

# Contact Information

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- 508-389-6359





Combined with human population growth and land-use change, climate change is a direct threat to the diversity of plant and animal species in many parts of the world, forcing already stressed species to respond to changes in climatic conditions that exceed the rate of change experienced in the past. The value of biodiversity has been recognized by policy actions such as passage of the Endangered Species Act and creation of National Parks and biosphere preserves. Climate change could make it difficult to preserve valued landscapes and many of the species that make them special

# Expert Panel Approach

## Benefits

- Makes use of institutional knowledge
- Can be done at various scales
- Low cost
- Can be done relatively quickly
- Iterative
- Transparent
- Process creates staff buy-in